

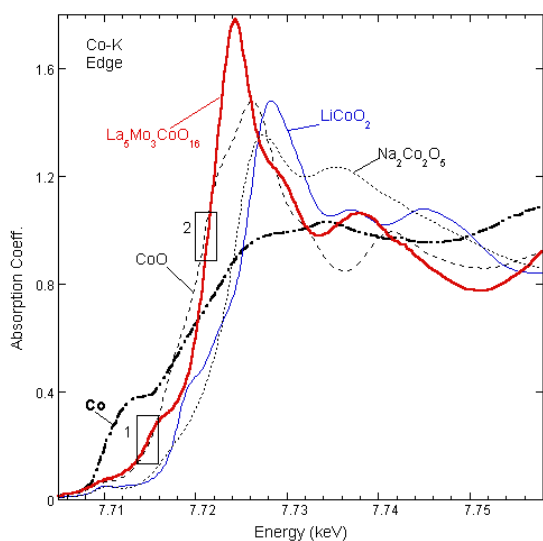
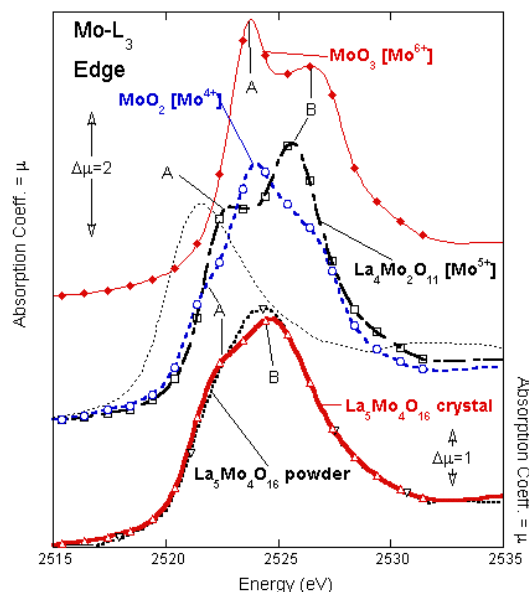
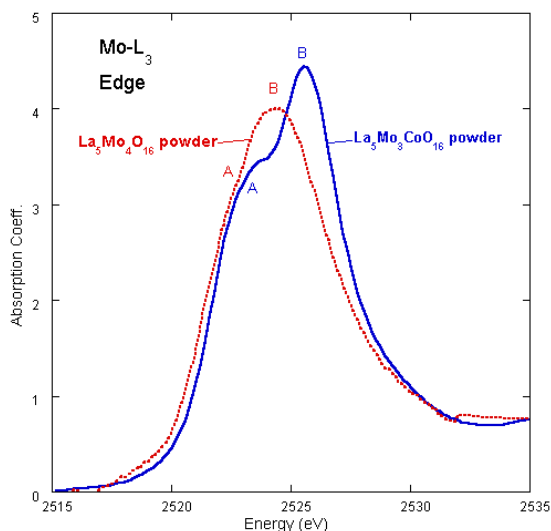
**XAS Studies of the  $\text{La}_5(\text{Mo},\text{Co})_4\text{O}_{16}$  System**

M. Croft, M. Greenblatt (Rutgers Univ.), K. V. Ramanujachary, E. Lofland (Rowan Univ.), W. McCarroll (Rider Univ.)

Beamline(s): X19A, X18B

$\text{La}_5(\text{Mo},\text{Co})_4\text{O}_{16}$  is a quasi-2-D compound containing perovskite-like  $\text{MoO}_3$  layers sandwiched between  $\text{Mo}_2\text{O}_{10}$  insulating clusters. Co substitution in this material occurs at the perovskite sites. In Figure 1 we show Co-K edge XAS measurements for  $\text{La}_5\text{Mo}_3\text{CoO}_{16}$  along with Co-standards. The coincidences between the  $\text{Co}^{2+}$  standard and the Mo/Co-compound spectra at the edge-onset energy (see box 1 in the figure) and the steeply rising portion of the edge energy (see box 2) clearly support a  $\text{Co}^{2+}$  state in the Mo/Co compound. Figure 2 shows the Mo-L<sub>3</sub> edges for a series of Mo-standards along with  $\text{La}_5\text{Mo}_4\text{O}_{16}$  samples in powder form and crystal-platelet-oriented-collage form, with the photon polarization vector in the platelet (ab) plane. The Mo-L<sub>3</sub> transitions involve empty Mo-d final states and therefore provide a probe of the empty d-density-of states (modified by matrix element and atomic multiplet effects). The A and B features of  $\text{MoO}_3$  (for example) are respectively associated with  $t_{2g}$  and  $e_g$  Mo-d final states. The spectral signatures of increasing Mo-valence are an A( $t_{2g}$ )-feature increases with and a chemical shift to higher energy of the centrum of the A-B feature group. The overall Mo-L<sub>3</sub> spectrum supports a Mo valence (averaged over all sites) well above 4+ but less than 5+. The oriented crystal spectrum is sensitive to d-orbital hole states oriented in the crystallographic ab-plane and manifests a much sharper crystal splitting.

Comparison of the Mo-L<sub>3</sub> edges for powdered samples of  $\text{La}_5\text{Mo}_4\text{O}_{16}$  and  $\text{La}_5\text{Mo}_3\text{CoO}_{16}$  (Figure 3) reveals that the Co substituted compound manifests a dramatically sharper, more intense A-feature and an overall shift to higher energy. This is consistent with the Mo-valence increase expected upon  $\text{Co}^{2+}$  substitution. Oriented crystal XAS measurements indicate a strong in-ab-plane character for the Co-induced Mo-d holes.

**Figure 1****Figure 2****Figure 3**